Table 1

Prevalence of root caries in US adults

Age Group	Percent of persons with ≥ 1 RDFS	Mean RDFS	Percent RDS/RDFS
18-24	6.9	0.3	100.0
25-34	13.6	0.6	83.3
35-44	20.8	1.0	70.0
45-54	28.7	1.2	66.7
55-64	38.2	1.7	58.8
65-74	47.0	2.2	40.9
75+	55.9	3.1	48.4
Total	22.5	1.0	70.0
Adjusted	25.1	1.2	58.3

Source: Winn et al, 1996

Table 2

Evidence table for incidence of root caries in community-dwelling North American populations

Study	Length of Study	Subjects	Age	Mean Teeth Present at Baseline	Increase in persons with 1 or more new RDF lesions per year (%)	Increase in severity (Net increment of surfaces per person, or surfaces per 100 at risk, per year)
Hand, Hunt & Beck (1988)	18 months	451 dentate subjects from a probability sample of 520 dentate individuals, living in two rural counties in Iowa, USA	65+	Men: 18.8 Women: 18.9 Both sexes: 18.8	Men: 30.6 Women: 28.7 Both sexes: 29.4	RDFS per person: Men = 0.64 Women = 0.52 Incidence RDFS per 100 susceptible root surfaces per person: Males: 3.5 Females: 2.1
Hand, Hunt & Beck (1988)	36 months	338 dentate subjects from a probability sample of dentate individuals, living in two rural counties in Iowa, USA - 60% dentate at baseline	65+	18.8	14.6	RDFS per person: 0.36 Incidence per 100 susceptible root surfaces per person: 1.8
Leske & Ripa (1989)	36 months	796 dentate, non-institutionalized subjects from fluoride-deficient communities in Long Island, NY- some from a clinical trial.	20-65 Mean = 39.9		6.2	RDFS per person: - 0.15 for the whole population; - 0.8 for those who developed root caries
Joshi et al. (1993)	24 months Median = 16 months	130 dentate middle and older aged non-institutionalized US individuals recruited from two other longitudinal studies.	45-82 Mean = 66.5	21.5	38.3	RDFS per person per year - 1.08 Incidence per 100 'susceptible' root surfaces per person - 2.82

Study	Length of Study	Subjects	Age	Mean Teeth Present at Baseline	Increase in persons with 1 or more new RDF lesions per year (%)	Increase in severity (Net increment of surfaces per person, or surfaces per 100 at risk, per year)
Wallace, et al. (1993)	48 months	171 randomly selected dentate urban, geriatric, non-institutionalized population in an optimally fluoridated area (Birmingham AB) rinsing with a placebo mouthrinse daily	60+	At least 15	Not stated	RDFS per person: 0.23
Lawrence, et al. (1995)	36 months	452 of the original 810 dentate subjects in the Piedmont 65+ Dental Study; non-institutionalised older adults from North Carolina, USA; both Caucasian and Black	65+	Blacks = 17.6 Whites = 21.0	Blacks = 9.7 Whites = 13	RDFS per person: Blacks = 0.18 Whites = 0.27 Incidence per 100 susceptible root surfaces per person Blacks = 0.87 Whites = 1.43
Lawrence, et al. (1996)	60 months	363 of the originally 810 dentate subjects from the Piedmont 65+ Dental Study; non-institutionalised older adults from North Carolina, USA; both Caucasian and Black	65+	Blacks = 17.6 Whites = 21.0	Blacks = 6 Whites = 7	RDFS per person: Blacks 0.1 Whites 0.08 Incidence per 100 susceptible root surfaces per person Blacks = 0.48 Whites = 0.45
Locker (1996)	36 months	493 of the originally 699 dentate subjects from a representative sample of older adults in Ontario, Canada	50+	18.9 as stated in 1993 paper	9.1 with one or more DFS (27.4/3) 5.6 with one or more DS (15.6/3)	Mean per person 0.2 RDFS 0.1 RDS

Table 3

Evidence table for diagnostic tests for root caries

Year	Authors	Subjects	Age	Gold standard	Diagnostic test	Results	Comment
1988	Nordenram et al.	52 extracted teeth with well-maintained crowns	65-95	Macroscopic (hand held?) examination of teeth using good light and explorer	Radiographic appearance of 104 root surfaces which ranged from sound to decayed	Calculated from data in the paper Sens = ..82* Spec = .68* * see comment #3	1. Gold standard 'clinical not histopathology 2. Has a range of disease - 31% of 104 surfaces were sound on both assessments; 3. Derived 2X2 table of comparison of the examinations has inconsistencies
1991	Sikri, Sikri	120 extracted teeth, with ' some signs of root caries formalin	Not stated	Macroscopic (hand held?) examination of teeth using good light and explorer using criteria of soft, leathery feel and color	Radiographs taken of single extracted teeth from buccal/lingual and anterior/posterior aspects	Calculated from data in the paper. Sens = .98* Spec = .95* * see comment #3	1. Gold standard ' clinical' not histopathology; 2. Has a range of disease - 40% of 480 surfaces were sound on both assessments; 3. Derived 2X2 table of comparison of the examinations has inconsistencies
1985	Newitter et al	6 extracted teeth stored in physiologic saline solution	Not stated	Six teeth unanimously diagnosed as sound or decayed by five dentists. Note: 5 dentists originally examined 26 teeth; agreed on 10 (38%) from which 6 were selected	5 blindfolded dentists using tactile sense with A: Conventional explorer B: Modified explorer with a 30 degree angle at tip	A Sens = .44 Spec = .77 B Sens = .74 Spec = .67	1. Weak gold standard since there was so little agreement on sound and decayed originally 2. Test (hand held?, blindfolded) does not correspond to clinical situation
1993	Beighton, Lynch, Heath	59 people with 301 lesions	29-80 (mean = 55)	Microbiological sampling of lesions	Clinical examinations and treatment need as per Hellyer et al, 1990 Soft = restore Leathery = restore Leathery = debride Leathery = fluoride Hard = nil	Isolation of both Lactobacillus and step mutans from vertical samples of the lesion: lowest in teeth needing nil treatment and highest in those needing restoration	1. Bacterial sampling of lesion acceptable 'gold standard'? 2. 'Treatment need' as a diagnostic criteria subjective 3. No sensitivity specificity reported

Year	Authors	Subjects	Age	Gold standard	Diagnostic test	Results	Comment
1994	Lynch & Beighton	395 primary root lesions in 117 patients attending the Royal London Hospital	29-80	1. Clinical texture of lesions: Soft Leathery and Hard and 2. Microbiological samples taken from lesions	Colour of lesion as defined by standard colour charts	Color of lesion had little relationship to texture or to microbiology " ...the colour of primary lesions has only limited diagnostic value..."	1. Microbiological profile of lesions acceptable gold standard? 2. Texture = weak gold standard not highly reliable; 3. All specimens defined as carious - no range of disease;

Table 4

NIDCR Evidence table for remineralization studies

Study/ Year	Authors	Study design	Source of sample	Sampling method and response rate	Number of subjects	Criteria for detection	Training of examiners	Reliability of examiners
(1) 1993	Wallace Retief Bradley	I (A)	Birmingham UK (fluoridated since 1981)	Random selection of dentate, non-institutionalized population aged 60 and older	603 with surfaces filled, decayed and 'at risk'	Katz (1986)	Not stated	Yes: checked with repeated exams
(2) 1993	DePaola	I (B)	Community residents in Boston MA and Portland ME	Volunteers	42 test 41 controls all with ≥ 1 active early buccal lesions	DePaola et al. 1989	Not stated	Not stated
(3) 1991	Schaeken Keltjens Van Der Hoven	I (B)	Not stated Netherlands?	Perio surgery patients on 3-month recall visits	44 subjects each had ≥ 2 decayed or filled root surfaces	Katz (1982)	Not stated	Not stated
(4) 1985	Billings, Brown, Kaster	II-3 (C) - for incipient lesions I (B) - for study of shallow lesions	Patients at University of Texas, (Houston)	Adults with untreated root caries	Six (6) patients with 54 active lesions	Banting (1980) and Billings (1986)	Not stated	Not stated

(Study #) / Other	Control for confounding	Blind examiners	Blind subject	Loss to Follow-up	Findings
(1) 4 year study APFgel 2X yearly and placebo rinse vs 0.05%NaF rinse daily vs Placebo rinse	Random allocation to groups	Not stated	Not stated	22.7%	After 4 years Mean number reversed lesions 1.01 APF gel 1.53 NaF rinse* 1.11 Control *p< .05
(2) 1 year study Test: 12,000ppm APF fluoride gel every 4 mo + daily home use of 5000ppm gel + 2x daily brushing with fluoride dentifrice Control: Pacebo gel every 4 mo + 2x daily brushing with fluoride dentifrice All with extensive OHI	Random allocation of subjects	Yes	Yes	14% -equivalent between test and control	After 1 year: Percent of patients experiencing one or more lesions arresting: Fluoride gel 31% Placebo gel 10% Chisq p<.025 Percent of initial (soft) lesions arrested: Fluoride gel 91% Placebo gel 40% Chisq p<.01 Percent of early cavitated lesions arrested: Fluoride gel 57% Placebo gel 8% Chisq p<.001
(3) 1 year study Test: Duraphat varnish at 3-mo intervals vs Chlorhexidine varnish at 3-mo intervals vs Control: Professional tooth cleaning every 3 mo as part of standard maintenance program	Random allocation to groups but controls had fewer root caries	Not stated	Not stated	0%	After one year: Percent of lesions hardening = 11% (of 49) Duraphat; 15% (of 62) Chlorhexidine 3% (of 29) Controls; p< .05 McNemar's Chisq
(4) 2 year study Incipient lesions Test: NaF gels in trays 5 min daily Shallow lesions Test: NaF gel in trays 5 min daily + Recontour + Smooth vs Control: NaF gel in trays 5 min daily	For incipient lesions - no control group For shallow lesions: Random allocation' of treatment for - but very unbalanced	Not stated	Not stated	0%	<u>Incipient lesions</u> Of 20 test lesions 14 arrested 3 active 3 progressed to shallow (treated with that regimen) <u>Shallow lesions</u> Test lesions: 16 of 16 were 'clinically sound' Control lesions: 1 of 5 arrested

Study/ Year	Authors	Study design	Source of sample	Sampling method and response rate	Number of subjects	Criteria for detection	Training of examiners	Reliability of examiners
(5) 1993	Emilson Ravald Birked	II-3 (C)	Sweden	Perio patients and others referred for root caries therapy	15 subjects with 770 exposed roots - all believed at risk	Hix and O'Leary (1976) plus Nyvad and Fejerskov (1982)	Not stated	Not stated
(6) 1987	Johansen, Papas, Fong, Olsen	Project 1: II-3 (C) Project 2: II -3 (C)	Project 1: Medical and healthy patients attending a private practice in New York State Project 2: Patients, aged ≥ 45, referred to Tufts Boston Me for medical conditions or high caries	Not stated	Project 1: 30 'most' with active caries Project 2: 94 of over 500 referred patients - they had 944 lesions	For active caries: criteria not stated Remineralized = increased surface hardness, altered color, lack of progression	Not stated	Not stated
(7) 1986	Nyvad Fejerskov	II-3 (C)	Not stated Denmark?	Not stated	10 people with 1-4 (24 total) root surface lesions on buccal surfaces	Lesions greasy, yellow or light brown, soft on probing	Not stated	Not stated

(Study #) / Other	Control for confounding	Blind examiners	Blind subject	Loss to Follow-up	Findings
(5) 1 year study Intensive oral hygiene instruction, + polishing + from 6 to 10 (mean of 7) topical fluoride (Duraphat) applications + 2x daily fluoride lozenges or rinses + fluoride toothpaste	Not stated No control group	Not stated	N/A	0%	Of 502 sound surfaces, 67 progressed Of 69 inactive lesions, 15 progressed Of 99 active lesions, 30 progressed and 37 became inactive
(6) Project 1: 4 years Project 2: 2 mos to 6 years; Testing Daily OH, + 16 days of NaF gels in trays at home followed by 2 min home rinses twice daily over study period + Non-sweet gum (ad lib?)	Not stated No control group in either project	Not stated	Not stated	Project 1: Not stated Project 2: 80% observed over 1 - 5 years	Project 1: After 4 years: Percent of lesions remineralized = 53% (for medical patients) 61% (for healthy patients) 56% overall Project 2 Percent of root 944 lesions remineralized = 77%
(7) 18-month study Test: OHI + plaque removal with tooth brush + swabbing with 2% NaF solution for 2 min at start again after 8 weeks + twice daily brushing with F toothpaste	Not stated No control group	No	No	O%	After 18 months: Typical lesion turned became hardened, dark (inactive?)

Table 5

Evidence table for restorative studies

Study/ Year	Authors	Study design	Source of sample	Sampling method and response rate	Number of subjects	Criteria for detection	Training of examiners	Reliability of examiners
(1) 1989	Levy Jensen Doering Sheth	I (B)	Not stated Iowa?	Not stated Patients attending university clinic? Elderly with ≥ 1 active lesion	50 people needing 104 restorations	Frank lesions= 0.5mm or deeper Restorations evaluated by USPHS criteria	Not stated	Not stated
(2) 1991	Duke Robbins Snyder	II-3 (C)	Not stated Texas?	Not stated Patients attending university clinic?	38 people needing treat. for ≥ 2 cervical lesions of which 32 were for root caries	Not stated	Not stated	Not stated
(3) 1988	Sheth Jensen Wefel Levy	II-3 (C)	Not stated Iowa	Not stated Patients attending university clinic? Elderly needing ≥ 1 root restoration	28 people with 123 (total) lesions	Not stated	Not Stated	Not Stated
(4) 1985	Billings, Brown, Kaster	II-3 (C)	Patients at Universtiy of Texas	Volunteers with untreated root caries	Six (6) patients with 54 (16 Grade III) active lesions	For Root caries: Banting (1980) For Grade: Billings (1986)	Not stated	Not stated

(Study #) / Other	Control for confounding	Blind examiners	Blind subject	Loss to Follow-up	Findings
(1) 1-year study Testing 59 composite resin restoration vs 45 GIC restoration	Random allocation of material to persons and lesions	Not stated	Not stated	29% Composite resin 33% GIC 31% overall	After 1 year: Full retention: Composite 76% (of 30) GIC 52% (of 42) Clinically acceptable: Composite 86% (of 30) GICs 70% (of 42)
(2) 3-year study Composite resin + dentin adhesive	Not stated No control group	Not stated	Not stated	8%	After 3 years: Retention = 92% Other quality criteria 79% or higher
(3) 1 year study Testing light activated composite resin + dentin bonding agent	Not Stated No control group	Not stated	Not stated	21% of lesions	After one year: Retention = 96.9% of the 97 remaining lesions
(4) 2 year study Testing GIC restorations for Grade III lesions	Not stated No control group	Not stated	Not stated	0%	After 2 years: GIC restorations (16) 16 intact, with no recurrent decay

Table 6

Reasons for and numbers of studies excluded

Evidence Table (terms used to select studies from the final data base)	Number of studies in evidence table (total number matching the terms in final database)	Number of studies excluded by reason
Incidence (incidence, root caries)	8 (24)	7 - not North America 3 - non - representative clinical trial control group 2 - special population (e.g. hospital patients) 2 - already included in table from another article 2 - non-systematic review
Diagnostic tests (diagnosis, reliability, agreement)	5 (57)	17 - not a diagnosis study 11 - non-systematic review 8 - predictive test/risk factor analysis 6 - article cited in text 3 - cited in text for evidence of reliability 3 - descriptive, expert opinion 3 - no data to abstract 1- in vitro study
Treatment (treatment)	Total 11 (69) 7 remineralization 4 restoration	27 - non-systematic review 22 - not treatment 5 - failed to meet inclusion criteria (less than one year duration, non-human study) 2 - technique (how to) study 1 - duplicate publication 1 - not able to obtain